Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT													
Alexander 1977	A	B	-	-	150		g			98	nc lower Michigan	lakes, streams, river	
Brooks & Davis 1987	A	B	1	SU	136	15.6 SE	g			5	nc PA 1982, sw OH 1979	streams	State: (1) Pennsylvania; (2) Ohio. Ohio stream found to have more available food resources.
	A	B	2	SU	158	11.5 SE	g			11			
Hamas 1975	A	B	-	-	147		g	140	169		Minnesota	lake	
Poole 1938	-	M	-	-	155		g			2	NS	NS	
Powdermill Nature Center (unpubl.)	A	B	-	-	148	20.8 SD	g	125	215	29	Pennsylvania	NS	As cited in Dunning 1984.
Salyer & Lagler 1946	A	B	-	-	170		g				Michigan	rivers, lakes	Converted from ounces; females average slightly more, males slightly less.
NESTLING WEIGHT													
Hamas 1981	N	B	-	-	10-12		g at hatch				Minnesota	lake	Number of days in unit column is age of nestlings. Values for day 2 - 28 estimated from figure; fledged at 28 days.
	N	B	-	-	16		g day 2	14	18	5			
	N	B	-	-	43		g day 6	39	46	5			
	N	B	-	-	64		g day 10	50	70	5			
	N	B	-	-	136		g day 14	127	146	5			
	N	B	-	-	165		g day 18	151	173	5			
	N	B	-	-	145		g day 22	141	150	5			
	N	B	-	-	121		g day 28	120	123	5			
FLEDGING WEIGHT													
Brooks & Davis 1987	F	B	1	-	148.6	13.3 SE	g			5	nc PA 1982, sw OH 1979	streams	Weight at fledging; N = number of nests sampled. State: (1) Pennsylvania; (2) Ohio. Ohio stream found to have more available food resources.
	F	B	2	-	169.2	11.9 SE	g			6			
Hamas 1981	F	B	-	-	121		g	120	123	5	Minnesota	lake	Lost weight after day 18 when reached 165 g.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
FOOD INGESTION RATE													
Alexander 1977	A	B	-	-	0.50		g/g-day				nc lower Michigan	lakes, streams, river	Estimate used for calculating predation pressure exerted by kingfishers on trout and other species.
Alexander 1974	N	B	-	-	0.41		g/g-day				nc lower Michigan	river	During second week of life; as cited in Alexander 1977.
White 1936	N	B	-	-			g/g-day	1.0	1.75	2	Nova Scotia, CAN 1935	river	Two hand-reared nestlings ate 40 or more yearling suckers (100 - 200 g total) per day. Kept from time prior to the breaking of flight feathers until fledging.

***** DIET *****

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Alexander 1977	B	B	trout		80			17	n lower Michigan	stream - % wet weight; stomach contents	Season is year round.
			non-trout fish		6						
			crustacea		2						
			insects		3						
			amphibians		9						
Alexander 1977	B	B	trout		17			19	n lower Michigan	lake - % wet weight; stomach contents	Season is year round.
			non-trout fish		29						
			crustacea		5						
			insects		19						
			amphibians		27						
			birds and mammals		1						
			unidentified		2						
Alexander 1977	B	B	trout		29			62	n lower Michigan	river - % wet weight; stomach contents	Season is year round.
			non-trout fish		32						
			unidentified fish		2						
			crustacea		17						
			insects		3						
			amphibians		13						
			vegetation		1						
			unidentified		3						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Davis 1982	J	B	crayfish		13.3			165	sw Ohio 1979	creek	Season = May through June. All prey were between 4 - 14 cm; 88% were between 6-12 cm in length. Author feels crayfish may be over-represented due to conditions of high water and high turbity during part of sampling time.
			cyprinids		76.4					-	
			(minnows)		(12.7)					% of number of prey;	
			(stonerollers)		(37.6)					brought to nestlings	
			(unidentified)		(26.1)						
			other fish		10.2						
Gould unpubl.	-	-	Pomolobus sp.		5			25	sc New York	streams, lakes	Fish species found two or fewer times not listed here; all types of insects were combined. As cited in Salyer and Lagler 1946.
			Salmo trutta fario		9					-	
			Catostomus c. commersonnii		14					number of prey;	
			Cyprinidae		12					stomach contents	
			Semotilus a. atromaculatus		15						
			Rhinichthys a. atratulus		7						
Gould upubl. (continued)			Notropis sp.		13						
			Ameiurus sp.		4						
			Beleosoma nigrum		4						
			Micopturus salmoides		5						
			Lepomis sp.		6						
			frogs		6						
			snakes		2						
			insects		10						
			crayfish		19						
Salyer & Lagler 1946	B	B	game and pan fish (mostly perch)		17.5			45	Michigan	lakes	More detailed identification and enumeration (but not % volume) of food items provided in report; season not specified but probably mostly summer.
			forage fish (minnows sticklebacks, sculpins, etc.)		49.1					-	
			other fish		2.0					% wet volume;	
			fish remains		0.9					stomach contents	
			frogs		2.3						
			crayfish		7.4						
			insects		21.0						
Salyer & Lagler 1946	B	B	game and pan fish (perch, centrachids)		10.15			22	Michigan	non-trout streams	More detailed identification and enumeration (but not % volume) of food items provided in report; season not specified but probably mostly summer.
			forage fish (minnows sticklebacks, etc.)		31.3					-	
			other fish		16.2					% wet volume;	
			fish remains		0.1					stomach contents	
			crayfish		39.6						
			insects		2.2						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Salyer & Lagler 1946	B	B	trout		29.8			92	Michigan	trout streams	More detailed identification and enumeration (but not % volume) of food items in paper; season not specified but probably mostly summer.
			other game and pan fish (perch and centrarchids)		13.0					-	
			forage fish (minnow, sticklebacks, etc.)		15.0					% wet volume; stomach contents	
			fish remains		0.9						
			crayfish		40.7						
			insects		0.6						
White 1936	B	B	salmon (1 year)		7			15	Nova Scotia, CAN 1935	river	
			salmon (fry)		58					-	
			trout		4					% of number of prey; stomach contents	
			stickleback		27						
			suckers		4						
White 1936	B	B	salmon fry		11			170	Nova Scotia, CAN 1935	riparian	
			salmon (1 year)		42					-	
			salmon (2 years)		1					% of number of prey; pellets	
			trout		15						
			sticklebacks		30						
			killifish		<1						
			suckers		<1						
White 1938	N	B	salmon (1 year old)		26			33	Nova Scotia, CAN 1937	river	Nestlings between 12 days and 4 weeks old; collected in June and July. Not fed sticklebacks, which were common in the diet of the adults.
			salmon (2 year old)		7					-	
			trout		6					number of prey; stomach contents	
White 1938	A	B	salmon		450			115	Nova Scotia, CAN 1937	river	53 disgorged stomach pellets and 62 stomachs collected from May - Sept. The ratio of trout to salmon increased as water levels increased.
			trout		214					-	
			sticklebacks		19					number of prey; pellets and stomach contents	
			water shrew		1						
White 1953	B	B	smelt		13			15	Prince Edward Island,CAN 1948	trout streams	
			trout		1					-	
			killifish		2					number of prey; pellets	
			sticklebacks		18						
White 1953	B	B	salmon		8			61	Maritime Provinces, CAN	streams	Year = 1948; provinces include New Brunswick, Nova Scotia, and Prince Edward Island, Canada.
			trout		54					-	
			suckers		5					number of prey; pellets	
			sculpins		101						
			minnows		29						
			sticklebacks		90						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
White 1953	B	B	salmon		10			44	Maritime Provinces, CAN	Moser River - number of prey; pellets	Years = 1940-42.
			trout		4						
			suckers		8						
			killifish		24						
			minnows		23						
			sticklebacks		10						
			eels		6						
White 1953	B	B	salmon		20.1			81	Maritime Provinces, CAN	small salmon streams - % of number of prey; pellets	Years = 1948.
			trout		6.0						
			suckers		9.7						
			minnows		40.4						
			sticklebacks		12.7						
			other fish		9.7						
			insects		1.3						
White 1953	B	B	salmon		24			29	Maritime Provinces, CAN	large salmon rivers - % of number of prey; pellets	Years = 1946, 1948.
			trout		7						
			suckers		20						
			minnows		24						
			sticklebacks		8						
			insects		4						
White 1953	B	B	alewife		47			36	Nova Scotia, CAN 1948	Gasperau Lake - number of prey; pellets	
			9-spine stickleback		139						
			killifish		33						
			white perch		19						
			yellow perch		50						
White 1953	B	B	9-spine stickleback		94			36	c Nova Scotia, CAN 1948	ponds and lakes - number of prey; pellets	
			killifish		4						
			white perch		2						
			yellow perch		6						
			dragonfly nymphs		2						
White 1953	B	B	sticklebacks		32			46	Nova Scotia, CAN 1948	Northumberland Str. - number of prey; pellets	Location also includes Prince Edward Island.
			killifish		74						
			other fish		12						
White 1953	B	B	sticklebacks		81			27	New Brunswick, CAN 1948	Northumberland Str. - number of prey; pellets	
			killifish		26						
			other fish		26						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
White 1953	B	B	sticklebacks		97			33	New Brunswick, CAN 1948	estuary	
			killifish		48					-	
			other fish		3					number of prey; pellets	

***** POPULATION DYNAMICS *****

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
TERRITORY SIZE													
Brooks & Davis 1987	A	B	1	SU	2.185	0.561 SE	km			8	nc PA 1982, sw OH 1979	streams	State: (1) Pennsylvania; (2) Ohio. Ohio stream found to have more available food resources. Breeding territory sizes measured by "herding" adults to the ends of their territorial boundaries.
	A	B	2	SU	1.028	0.280 SE	km			8			
Cornwell 1963	A	B	BR	SU	1.6		km	0.8	8.0		Minnesota 1958	lake, forest	Foraging radius; most flights were within 1.6 km but flights of 3.2 km were not uncommon.
Davis 1980	A	B	BR	SP	1.03	0.22 SE	km			6	sw Ohio 1979	stream	Length of breeding territories (occupied by pairs) and non breeding territories (occupied by individuals in the late summer and fall).
	B	B	NB	FA	0.39	0.093 SE	km			21			
Salyer & Lagler 1946	A	B	BR	SU	0.80		km		2.4		Michigan 1931	lakes	Breeding territory of pairs along lake shore.
Salyer & Lagler 1946	A	B	BR	SU	2.4-4.8		km				Michigan 1931	rivers	Larger than along lakes because of limitation in feeding areas (faster, deeper water).
Salyer & Lagler 1946	A	B	BR	SU	14.2		ha			1	Michigan 1931	ponds and marsh	
POPULATION DENSITY													
Brooks & Davis 1987	A	B	1	SU	0.11		pairs/km			45.8	nc Pennsylvania 1982	streams	Density of breeding pairs; (1) Sandy Lick Creek, (2) Bennett Branch. N = km of stream sampled.
	A	B	2	SU	0.19		pairs/km			16.1			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Brooks & Davis 1987	A	B	BR	SU	0.54		pairs/km			16.8	sw Ohio 1979	stream	Density of breeding pairs; the Ohio stream was found to have more available food than the Pennsylvania streams above. N = km of stream sampled.
Cornwell 1963	A	B	BR	SU	0.0022		pairs/ha			14	Minnesota 1958	lake, forest	6,475 ha censused.
White 1936	A	B	BR	SU	0.6		pairs/km			30	Nova Scotia, CAN 1935	streams	50 km surveyed.
White 1953	B	B	-	SU			N/km		6		Maritime Provinces, CAN	stream valleys	Population of young and adults in agricultural district often reaches this density.
CLUTCH SIZE													
Brooks & Davis 1987	-	-	1	-	5.8	0.7 SE				8	nc PA 1982,	streams	State: (1) Pennsylvania; (2) Ohio. Ohio stream found to have more available food resources.
	-	-	2	-	6.8	0.4 SE				6	sw OH 1979		
Hamas 1975	-	-	-	-	6.58			5	7		Minnesota	lake	
White 1953	-	-	-	-	7			5	7		Maritime Provinces, CAN	streams	Seven is the "usual" number of eggs laid.
CLUTCHES/YEAR													
Bent 1940	-	-	-	-	1		/yr				NS	NS	Known to renest up to three times if clutch is lost.
Brooks & Davis 1987	-	-	-	-	1		/yr				nc PA 1982, OH 1979	streams	May renest if clutch lost early in breeding season.
Hamas 1975	-	-	-	-	1		/yr				Minnesota	lake	Will renest if nest is destroyed.
DAYS INCUBATION													
Hamas 1975	-	-	-	-	22		days				Minnesota	lake	
AGE AT FLEDGING													
Bent 1940	-	-	-	-	28		days				NS	NS	
Hamas 1975, 1981	-	-	-	-	28		days	27	29		Minnesota	lake	

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
N FLEDGE/ACTIVE NEST													
Brooks & Davis 1987	-	-	1	-	4.5	1.9 SE	N/act nest			8	nc PA 1982,	streams	State: (1) Pennsylvania; (2) Ohio. Ohio stream found to have more available food resources.
	-	-	2	-	5.3	2.2 SE	N/act nest			6	sw OH 1979		
AGE AT SEXUAL MATURITY													
Bent 1940	-	B	-	-	1		year				throughout range		

***** SEASONAL ACTIVITIES *****

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING SEASON						
Hamas 1975	Apr	Apr-May	earl Jul	Minnesota	lake	
HATCHING						
Hamas 1975	May	June	late Jul	Minnesota	lake	
White 1936		earl Jun		Nova Scotia, CAN 1935	river	
FLEDGING						
White 1936			late Jul	Nova Scotia, CAN 1935	river	
FALL/BASIC MOLT						
Bent 1940	Aug		Oct	NS	NS	Complete molt.
Hamas unpubl.	June	July	Aug	Minnesota	lake	Personal communication.
SPRING/ALTERNATE MOLT						
Bent 1940	Feb		Apr	NS	NS	First complete molt for young birds.

Reference	Begin	Peak	End	Location	Habitat	Notes
FALL MIGRATION						
Bent 1940			mid Oct	Maine	NS	Departures.
Bent 1940			late Oct	Alberta, CAN, MT, ND	NS	Departures.
Bent 1940			mid Nov	SD, NE, WI, NY	NS	Departures.
Bent 1940			late Nov	Kansas	NS	Departures; sometimes overwinters.
Bent 1940			mid Dec	Mass., New Jersey	NS	Departures.
Bent 1940			late Dec	Connecticut	NS	Departures.
Salyer & Lagler 1946	Sept	Oct	Nov	Michigan	several	
White 1953		mid Sep	late Oct	Maritime Provinces, CAN	streams	
SPRING MIGRATION						
Bent 1940	late Feb			PA, RI, MO	NS	Beginning of arrivals.
Bent 1940	earl Mar			s MI, IA, Ontario, CAN	NS	Beginning of arrivals.
Bent 1940	mid Mar			NY, CT, IL, WI	NS	Beginning of arrivals.
Bent 1940	late Mar			VT, NH, MT	NS	Beginning of arrivals.
Bent 1940	earl Apr			Maine, Nova Scotia, CAN	NS	Beginning of arrivals.
Bent 1940	mid Apr			Quebec, CAN	NS	Beginning of arrivals.
Bent 1940	late Apr			Alberta, CAN	NS	Beginning of arrivals.
Hamas 1975	Mar	Apr	May	Minnesota	lake	
White 1953	earl Apr	late Apr		Maritime Provinces, CAN	streams	
White 1938	late Apr		earl May	Nova Scotia, CAN 1937	river	

*** NORMALIZING AND CONTACT RATE FACTORS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units		Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT														
Kale 1965	A	M	-	-	10.61	0.7 SD	g				52	e Georgia	salt marsh	Resident population only.
	A	F	-	-	9.41	1.1 SD	g				25	1958-61		
	J	B	-	-	9.44	1.6 SD	g				56			
Kale 1965	A	M	-	WI	10.0	0.5 SD	g		9.4	10.7	7	Georgia	captive	Average of mean weights of the same captive adults in winter (September to March) and spring (March to September). Field collections also followed this trend.
	A	M	-	SP	10.9	1.0 SD	g		9.8	11.9	7	1962-63		
	A	F	-	WI	8.8	0.4 SD	g		8.4	9.2	3			
	A	F	-	SP	9.2	0.3 SD	g		9.0	9.6	3			
Tintle (unpubl)	A	F	BR	-	10.6	0.99 SD	g		9.0	13.5	38	New York	NS	As cited in Dunning 1984.
	A	M	BR	-	11.9	0.72 SD	g		10.5	13.5	38			
BODY FAT														
Kale 1965 (griseus)	A	M	-	-	1.03	0.23 SD	g				35	e Georgia	salt marsh	Estimated percent of total body weight: adult males = 10%; adult females and immatures = 11%. Author notes that this subspecies is non-migratory and does not tend to accumulate large amounts of fat.
	A	F	-	-	1.04	0.26 SD	g				18	1962-63		
	J	B	-	-	1.04	0.21 SD	g				34			
EGG WEIGHT														
Kale 1965	E	-	-	-	1.14	0.10 SD	g				127	e Georgia 1958-61	salt marsh	
Welter 1935	E	-	-	-	1.48		g		1.41	1.56		New York 1931	freshwater marsh	Eggs weighed from two complete clutches.
NESTLING WEIGHT														
Welter 1935	N	B	-	-	1.1		g	day 1				New York, Minn. 1931	fresh marshes	Estimated from growth curve determined from weights of 50 nestlings. Day in unit column is age of nestling.
	N	B	-	-	2.1		g	day 3						
	N	B	-	-	4.7		g	day 5						
	N	B	-	-	6.8		g	day 7						
	N	B	-	-	10.0		g	day 9						
	N	B	-	-	10.6		g	day 11						
	N	B	-	-	11.3		g	day 13						

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
FLEDGING WEIGHT													
Kale 1965	F	B	-	-	8.84	0.70 SD	g			5	Georgia 1958-61	salt marsh	
Leonard & Picman 1988	F	B	1	-	9.5	0.5 SD	g day 8			8	Manitoba, CAN 1983-85	brackish marsh	(1) Fed by males and females; (2) fed by females only. Nestling weight at 8 days; fledging can occur as early as 11 days.
	F	B	2	-	8.1	1.3 SD	g day 8			29			
LEAN (DRY) BODY WEIGHT													
Kale 1965	A	M	-	-	2.60	0.2 SD	g			35	e Georgia 1962-63	salt marsh	Estimate of percent of total body weight: adult males = 25%; adult females = 24%; and juveniles = 23%.
	A	F	-	-	2.22	0.3 SD	g			18			
	J	B	-	-	2.20	0.3 SD	g			34			
METABOLIC RATE (OXYGEN)													
Kale 1965	A	B	BA	-	91.2		lO2/kg-d			7	Georgia 1962-63	lab	(BA) basal; (NB) near basal; and (AC) light activity metabolism. Calculated by oxygen respirometry.
	A	B	NB	-	112.8		lO2/kg-d			30			
	A	B	AC	-	169		lO2/kg-d			28			
METABOLIC RATE (KCAL BASIS)													
Kale 1965	A	B	FL	-	880	90 SD	kcal/kg-d			10	Georgia 1962-63	lab	"Free-living": Determined by measuring daily food intake, excretory losses, assimilation, and respiration for active birds in small cages (173 weekly determinations total). Daily intake = 1,155 kcal/kg-d and excretory losses = 270 kcal/kg-day.
Kale 1965	A	B	BA	-	444		kcal/kg-d			7	Georgia 1962-63	lab	(BA) basal; (NB) near basal; (AC) and light activity. Estimated from oxygen respirometry values.
	A	B	NB	-	557		kcal/kg-d			30			
	A	B	AC	-	788		kcal/kg-d			28			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
FOOD INGESTION RATE													
Kale 1965	A	B	FL	-	1,155	130 SD	kcal/kg-d			10	Georgia 1962-63	captive	Measured food ingestion in the lab and caloric value of food; diet was live mealworms and a moist mixture of liver, fish, game bird food and Pablum. "Free-living"; see metabolic rate record for FL.
this study	A	B	FL	-	0.67		g/g-day				Georgia 1962-63	captive	"Free-living"; estimated from "free-living" caloric intake rate measured by Kale 1965 (1,155 kcal/kg-d). Assumed 5.62 kcal/gram insect diet (dry wt), a diet assimilation efficiency of 70%, and a 67% water content of insects.
this study	A	F	FL	-	0.99		g/g-day				NS	NS	Free-living; estimated from free-living metabolic rate estimate using Nagy (1987) allometric equation, which predicts 1,209 and 1,174 kcal/kg-day for a 9.4 g female and a 10.6 g male marsh wren, respectively. Assumed 5.26 kcal/gram insect (dry wt), assimilation efficiency of 70%, and a 67% water content for insects.
	A	M	FL	-	0.96		g/g-day						
THERMONEUTRAL ZONE													
Kale 1965	A	-	-	-			degrees C	23	35		Georgia 1962-63	lab	Calculated using an oxygen respirometer.

***** DIET *****

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Kale 1965	B	B	Hymenoptera		17.3		12.4	195	e Georgia 1958-61	salt marsh - % wet volume; stomach contents	Summer column = breeding season (April - August) and winter column = non-breeding season (September - March). Fulgoridae = Prokelisia marginata; Hemiptera = Ischnodemus badius; Orthoptera = Orchelimum fidicinum. Families with less than 2% in both season not reported here. Combination of fall and winter data.
			(Formicidae)		(10.2)		(7.4)				
			(Braconidae)		(3.7)		(1.2)				
			Homoptera		13.0		40.1				
			(Fulgoridae)		(11.9)		(39.8)				
			Coleoptera		11.6		12.6				
			(Curculionidae)		(3.6)		(8.2)				
			(Cleridae)		(3.5)		(8.9)				
			Lepidoptera		14.6		2.9				
(continued)			(larvae and eggs)		(10.4)		(2.9)				

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Kale 1965 (continued)			Diptera		8.9		7.7				
			(Ephydridae)		(2.8)		(4.8)				
			Hemiptera		5.4		10.0				
			Orthoptera		5.6		0.8				
			spiders		15.1		6.2				
			other arthropods (crabs, amphipods)		1.8		0.9				
			molluscs (Littorina irrorata)		3.5		4.0				
			undetermined		4.5		3.3				

***** POPULATION DYNAMICS *****

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
TERRITORY SIZE													
Kale 1965	A	M	1	SP	0.0060	0.0014	SD ha			11	Georgia	salt marsh	Study illustrates differences in territory size between nearby marshes and at the same marsh in different years: (1) marsh #1 - 1958; (2) marsh #2 - 1958; (3) marsh #2 - 1959; (4) marsh #4 - 1960; (5) marsh #4 - 1961.
	A	M	2	SP	0.0156	0.0050	SD ha			12	1958-59		
	A	M	3	SP	0.0085	0.0042	SD ha			22			
	A	M	4	SP	0.0088	0.0047	SD ha			13			
	A	M	5	SP	0.0113	0.0058	SD ha			11			
Leonard & Picman 1986	A	M	BR	SP	0.07	0.06	SD ha			13	Manitoba, CAN	homogenous cattail marsh	Male breeding territory sizes on control (undisturbed) marsh. Spring = May 22 to June 5. Summer = June 19 to July 3.
	A	M	BR	SU	0.09	0.05	SD ha			13	1984		
Verner 1965	A	M	1	SP	0.169	0.021	SE ha	0.0242	0.360	26	w Washington	shallow mixed marsh	Seattle study site: (1) Red Marsh; (2) Blue Marsh; (3) Yellow Marsh. All three areas were extensive freshwater marshes (maximum depth 12 to 18 inches) with mixed stands of cattail and bulrush scattered throughout.
	A	M	2	SP	0.126	0.002	SE ha	0.0688	0.220	27	1961-62		
	A	M	3	SP	0.137	0.003	SE ha	0.0419	0.240	29			
Verner & Engelson 1970	A	M	0	-	0.0516	0.0183	SE ha			13	e Washington	pond-margin marsh	Territory of males: (0) bachelors (no females); (1) monogamous; (2) bigamous. Turnbull study sites. Narrow freshwater pond-margin marshes consisted of strips of cattails and bulrushes.
	A	M	1	-	0.0642	0.0090	SE ha			47	1967		
	A	M	2	-	0.0685	0.0169	SE ha			20			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Verner 1964	A	M	0	-	0.099		ha	0.024	0.260	23	w Washington 1961-62	shallow mixed marsh	Territory of males: (0) bachelors (no females) males; (1) monogamous; (2) bigamous. Average of means for the three Seattle sites. pairs per year.
	A	M	1	-	0.154		ha	0.049	0.318	32			
	A	M	2	-	0.222		ha	0.117	0.360	12			
POPULATION DENSITY													
Kale 1965	A	B	BR	SP	48.3	5.3 SD	pairs/ha	45.1	56.2	4	e Georgia 1958-61	salt marsh	Density of pairs in potential available nesting habitat defined as narrow strips of tall Spartina bodering tidal ditches (= 10.1 ha of 882 ha marsh area). Almost all males in poulation were monogamous. N = number of years; min and max are yearly means; density measures associated with between 450 & 570
Leonard & Picman 1987	A	M	-	SP	2.6	0.9 SD	N/ha	1.8	3.6	3	Manitoba, CAN 1983-85	homogeneous cattail marsh	Density in suitable breeding habitat; N = number of years. Mating status of males; 11% = bachelors; 48% = monogamous; 37% = bigamous; and 3% = trigamous. Female density is difficult to determine because males may be associated with different numbers of them at various times during the breeding season.
Leonard & Picman 1987	A	M	-	SP	3.7	0.5 SD	N/ha	3.4	4.3	3	Manitoba, CAN 1983-85	cattail, bulrush and phragmites marsh	Density in suitable breeding habitat; N = number of years. Mating status of males; 5% = bachelors; 41% = monogamous; 43% = bigamous; and 12% = trigamous. Female density is difficult to determine because males may be associated with different numbers of them at various times during the breeding season.
Verner 1965	A	B	1	SP	8.5		N/ha				w Washington 1961-62	shallow mixed marsh	Seattle study site(s): (1) Red and Blue Marshes 1961 - 4.0 ha (19 males, 15 females); (2) Yellow Marsh 1962 - 1.3 ha (10 males, 12 females).
	A	B	2	SP	16.9		N/ha						

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
CLUTCH SIZE													
Kale 1965	-	-	-	-	4.5			3	5	192	e Georgia 1958-61	salt marsh	Completed clutches.
Leonard & Picman 1987	-	-	-	-	5.8	0.8 SE				79	Manitoba, CAN 1983-84	homogenous cattail marsh	
Leonard & Picman 1987	-	-	-	-	5.6	0.8 SE				96	Manitoba, CAN 1983-84	cattail, bulrush, and phragmites marsh	
Verner 1965	-	-	1	-	5.2	0.11 SD		4	6	32	w Washington 1961-62	shallow mixed marsh	Seattle sites. Year: (1) 1961; (2) 1962.
	-	-	2	-	4.4	0.14 SD		3	6	22			
Verner 1965	-	-	-	-	6.0	0.19 SD		4	8	25	e Washington 1962	pond-margin marsh	Turnbull sites.
Welter 1935	-	-	-	-	5			3	6	40	New York, Minn. 1931	fresh marsh	5 = "most frequent" number of eggs.
CLUTCHES/YEAR													
Kale 1965	-	-	-	-	1-2		broods/yr	0	3		e Georgia 1958-61	salt marsh	Broods raised per year.
Verner 1965	-	-	1	-	2-3		broods/yr	0	3		Washington 1961-62	fresh marshes	Number of broods raised per season at the: (1) Seattle study areas (western WA), and; (2) the Turnbull study areas (eastern WA).
	-	-	2	-	2		broods/yr	0	2				
Welter 1935	-	-	-	-	2		broods/yr				New York, Minn. 1931	fresh marsh	Broods per year.
DAYS INCUBATION													
Kale 1965	-	-	-	-	13.1		days	12	14	35	e Georgia 1958-59	salt marsh	Days from last egg laid to last egg hatched.
Verner 1965	-	-	-	-	15.1		days	13	16		w Washington 1961-62	shallow mixed marsh	Minimum in July; maximum in April.
Welter 1935	-	-	-	-	13		days				New York, Minn. 1931	fresh marsh	

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
AGE AT FLEDGING													
Kale 1965	-	B	-	-	12-13		days	10-11	13-15		e Georgia 1958-61	salt marsh	
Verner 1965	-	B	-	-	14		days	11-12	15-16		Washington 1961-62	fresh marshes	From age of oldest nestlings.
N FLEDGE/ACTIVE NEST													
Kale 1965	-	-	-	-	1.9	1.2 SD	N/pair	0.55	3.50	217	e Georgia 1958-61	salt marsh	Males in this population are almost all monogamous; includes both first and second broods. Minimum and maximum are yearly means. Sample size = number of fledglings.
Leonard & Picman 1987	-	-	-	-	2.3	2.6 SD	N/act nest			81	Manitoba, CAN 1983-84	homogeneous cattail marsh	
Leonard & Picman 1987	-	-	-	-	3.4	3.4 SD	N/act nest			95	Manitoba, CAN 1983-84	cattail, bulrush, and phragmites marsh	This site had denser vegetation and deeper water than the one above; this was thought to reduce losses due to predation.
N FLEDGE/SUCCESSFUL NEST													
Leonard & Picman 1987	-	-	-	-	5.1	1.2 SD	N/suc nest			37	Manitoba, CAN 1983-84	homogeneous cattail marsh	
Leonard & Picman 1988	-	-	1	-	5.4	0.7 SD	N/suc nest			10	Manitoba, CAN 1983-85	fresh marsh	Success with (1) both adults feeding nestlings; (2) female only feeding nestlings.
	-	-	2	-	4.4	1.8 SD	N/suc nest			45			
Leonard & Picman 1987	-	-	-	-	4.5	1.3 SD	N/suc nest			71	Manitoba, CAN 1983-84	cattail, bulrush, and phragmites marsh	
PERCENT NESTS SUCCESSFUL													
Kale 1965	-	-	-	-	21	15 SD	% eggs suc	7	42	1,111	e Georgia 1958-61	salt marsh	Percent of eggs laid that fledged young; N = number of eggs laid.
Leonard & Picman 1987	-	-	-	-	60		% nests su			176	Manitoba, CAN 1983-85	fresh marshes	Percent fledging at least one young.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
AGE AT SEXUAL MATURITY													
Leonard & Picman 1987	-	B	-	-	1		year				Manitoba, CAN 1983-85	fresh marsh	
Verner 1971	-	B	-	-	1		year				Washington 1967-68	fresh marsh	
ANNUAL MORTALITY													
Kale 1965	N	B	-	-	79		% lost/yr			785	Georgia 1958-61	salt marsh	Percent eggs and young lost prior to fledging from all causes.
Kale 1965	A	B			32		%/yr				e Georgia 1958-61	salt marsh	Estimated by author from knowledge of this non-migratory population and review of other studies. Juvenile = from fledging to next breeding season.
	J	B			70		%/yr						
Verner 1971 (platensis)	A	B	-	-	81.6		%/yr			173	w Washington 1967-68	fresh marsh	Nestlings and adults banded and censused at the start of the next season. Thought to be too high to maintain population; possible reasons for calculation of estimate to have come out so high are discussed in paper.
	J	B	-	-	87.9		%/yr			91			

***** SEASONAL ACTIVITIES *****

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING						
Kale 1965	Apr		mid Aug	e Georgia 1958-61	salt marsh	Breeding starts when daily mean temperatures exceed 15 C. Includes first and second broods and renesting attempts (replacing lost nests).
Verner 1965	late Mar	Apr - May	mid Jul	w Washington 1961-62	shallow mixed marsh	Seattle sites; up to three broods raised per season.
Verner 1965	mid Apr	May - Jun	earl Jul	e Washington 1962	pond-margin marsh	Turnbull sites; up to two broods raised per season.
Welter 1935	late May	earl June		New York 1931	fresh marsh	First brood.
Welter 1935	late Jul		earl Aug	New York 1931	fresh marsh	Second brood.

Reference	Begin	Peak	End	Location	Habitat	Notes
HATCHING						
Verner 1965	mid Apr		earl Aug	w Washington 1961-62	shallow mixed marsh	Seattle sites; up to three broods raised per season.
Verner 1965	earl May		mid Jul	e Washington 1962	pond-margin marsh	Turnbull sites; up to two broods raised per season.
FLEDGING						
Verner 1965	mid May	Jun - Jul	late Aug	w Washington 1961-62	shallow mixed marsh	Seattle sites; up to three broods raised per season.
Verner 1965	earl Jun	Jun - Jul	earl Aug	e Washington 1962	pond-margin marsh	Turnbull sites; up to two broods raised per season.
FALL/BASIC MOLT						
Welter 1935	earl Sep		Oct	New York, Minn. 1931	fresh marsh	Adults molt the earliest, followed by juveniles from the first brood, and then juveniles from the second brood.
FALL MIGRATION						
Welter 1935	Sept		late Oct	New York, Minn. 1931	fresh marsh	Departure from breeding grounds. Most adults are gone by mid September; juveniles leave later.
SPRING MIGRATION						
Verner 1965		mid Mar		e Washington 1961-62	pond-margin marsh	Turnbull sites; Seattle sites had non-migratory populations.
Welter 1935	Apr	May 10	June	New York, Minn. 1931	fresh marsh	Arrival of males; males tend to arrive before females.
Welter 1935	Apr	May 20-28	June	New York, Minn. 1931	fresh marsh	Arrival of females.

******* AMERICAN ROBIN *******

***** NORMALIZING AND CONTACT RATE FACTORS *****

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units		Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT														
Clench & Leberman 1978	A	B	-	-	77.3	0.36 SE	g		63.5	103	401	Pennsylvania	NS	As cited in Dunning 1984 (collected in all seasons).
Hazelton et al. 1984	-	-	-	SU	55		g				6	Kansas 1981	NS	Age of birds not specified.
Howell 1942	A	B	-	-	80.8		g					sc New York 1937-38	forest	
Jung 1992	A	M	-	SU	77.2	4.0 SD	g		72.0	84.5	9	Wisconsin 1990	NS	Collected in late June through July. For 2 of the 7 adult females, weight at release rather than capture was used to determine the mean - for one it was unavailable, and for a second the value appeared to be a misprint (35.9 g).
	A	F	-	SU	79.5	7.4 SD	g		70.0	93.0	7			
	J	B	-	SU	74.6	3.8 SD	g		70.0	84.0	19			
Levey & Karasov 1989	-	-	-	SU	78.4	3.6 SD	g				10	Wisconsin	NS	
Morrison & Caccamise 1990	A	B	-	FA			g		73	84	9	c New Jersey 1987	garden	Weight of post-breeding robins captured in June - November for radiotagging study.
Skorupa & Hothem 1985	B	B	-	FA	82.3		g				45	California 1982	vineyards	Collected in August and September.
Wheelwright 1986	A	M	NB	-	86.2	6.1 SD	g				26	New York	woodlands	NB = during the non-breeding season; BR = during the breeding season.
	A	F	NB	-	83.6	6.4 SD	g				18			
	A	M	BR	-	77.4		g				21			
	A	F	BR	-	80.6		g				6			
NESTLING WEIGHT														
Howell 1942	N	B	-	-	5.5		g	day 0	4.1	6.7	13	sc New York 1937-38	forest	Day in units column is age of nestling; day 0 is hatch day. Most fledge by 13-14 days. Juveniles reach adult weight at about six weeks of age.
	N	B	-	-	12.6		g	day 2	8.4	17.5	25			
	N	B	-	-	24.3		g	day 4	17.9	32.3	23			
	N	B	-	-	39.4		g	day 6	32.5	45.9	23			
	N	B	-	-	50.9		g	day 8	42.0	59.3	21			
	N	B	-	-	55.2		g	day 10	49.0	63.2	19			
	N	B	-	-	55.0		g	day 14	51.8	58.2	7			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
EGG WEIGHT													
Howell 1942	E	-	-	-	6.26		g	4.6	8.4	60	sc New York 1937-38	forest	
Knupp et al. 1977	E	-	-	-	6.29		g			18	n Maine 1971	forest	
METABOLIC RATE (KCAL BASIS)													
Hazelton et al. 1984	-	B	EX	-	344		kcal/kg-d				Kansas 1981	captive	(EX) Existence energy requirement based on Kendeigh's (1969) equation with robin weight of 55 g. Age not specified.
FOOD INGESTION RATE													
Hazelton et al. 1984	-	B	-	-	1.52	0.25 SD	g/g-day	1.22	1.96	6	Kansas 1981	captive	Fruit consumption during two day feeding trials. Average of means determined in tests of various pairings of fruits (strawberries, pitted cherries, green grapes, purple grapes); 12 trials conducted on each pairing. Mean weight of robins = 55 g, mean temperature during trials = 26 C. Water was provided ad libitum.
	-	B	-	-	1,070	220 SD	kcal/kg-d	760	1,330	6			
Skorupa & Hothem 1985	B	B	1	FA	0.75	0.62 SD	g/g-day			45	California 1982	vineyards	Season = Aug. and Sept.; (1) consumption of grapes only; determined from assumption that gizzard samples contain 2 hours worth of foraging effort and foraging is possible 13 hours/day. Grapes comprised a mean of 85 aggregate % wet weight of food. (2) For this study an estimate of total food consumed was calculated from the grape only value. The aggregate % of the rest of the diet was 11.5 % animal and 4.5 % other plants. Mean weight of birds = 82.3 g.
	B	B	2	FA	0.89	0.73 SD	g/g-day			45			
SURFACE AREA													
Walsberg & King 1978	A	B	-	-	198.0		cm2				NS	NS	Beak surface area 3.1 cm2; leg surface area 14.0 cm2.

***** DIET *****

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Hamilton 1943	B	B	plants	81.5				200	c New York 1942	lawns, hedges - frequency of occurrence; fecal analyses	Droppings collected from May 1 to June 12.
			(barberry)	(61.0)							
			(sumac)	(29.0							
			(coral berry)	(4.5)							
			animals	93.5							
			(beetles)	(82.5)							
			(millipedes)	(38.5)							
			(ants)	(27.0)							
			(cutworms)	(9.5)							
			(sowbugs)	(6.5)							
			(wireworms)	(4.0)							
			(flies)	(3.0)							
			(cockroaches)	(1.5)							
Hamilton 1940	B	B	plants		73.14			700	c New York 1939	yard, hedgerow - frequency of occurrence; fecal analyses	Droppings collected from June 24-August 11. Lepidoptera found were chiefly cutworm larvae. Items found in less than 2% of the samples not included here.
			(choke cherry)		(58.29)						
			(blackberry)		(40.09)						
			(raspberry)		(21.10)						
			(pin cherry)		(17.00)						
			(rum cherry)		(11.71)						
			(Lonicera sp.)		(8.28)						
			(blue nightshade)		(5.86)						
			(shadberry)		(2.43)						
			Arthropoda		78.86						
			(Arachnida)		(3.43)						
			(Orthoptera)		(5.57)						
			(Coleoptera)		(11.30)						
			(Lepidoptera)		(6.86)						
			(Hymenoptera)		(38.43)						
			Mollusca		3.28						
			(Cochlicopidae)		(2.57)						
Howell 1942	J	B	earthworms		15.0			15	sc New York 1937	forest - % wet weight; stomach contents	Age of robins ranged from 3 - 35 days; collected from May 12 to July 10, 1937. Suggests that the presence of grass is accidental; it is carried along with prey. Items comprising less than 1% not included here.
			sowbugs		1.7						
			spiders		2.3						
			millipedes		3.1						
			short-horned grass-hoppers		4.9						
			beetles		11.6+						
			lepidopteran larvae		24.7						
			ants		3.2						
			unident. animal		5.2						
			grass (blades, stem, roots)		19.5						
			mulberries		3.2						
			honeysuckle family seeds		2.4						
			unident. plants		4.2						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Martin et al. 1951	B	B	plant food	21	60	81	64		United States	NS	See records below for details regarding plant component of diet.
			animal food	79	40	19	36			-	
			(sample size)	(316)	(514)	(151)	(442)			rough estimate of percent diet; stomach contents and observations	
Martin et al. 1951	B	B	cherry (cult. and wild) - SuF		10-25			770	northeast US	NS	Plant foods only. All seasons together, but abbreviation following plant name notes what season that plant is important. Samples from: winter = 77; spring = 199; summer = 327; fall = 167. Species comprising less than 2% not included here.
			dogwood - FW		5-10					-	
			sumac - WSp		5-10					rough estimate of percent diet; stomach contents and observations	
			blackgum - FW		5-10						
			grape (cult. and wild) - SuFW		2-5						
			redcedar - FWSp		2-5						
			Virginia creeper - FWSp		2-5						
			blackberry - Su		2-5						
Martin et al. 1951	B	B	chinaberry - WSp		5-10			263	se US excluding FL	NS	Plant foods only. All seasons together, but abbreviation following plant name notes what season that plant is important. Samples from: winter = 215; spring = 29; summer = 17; fall = 2. Species comprising less than 2% not included here.
			blackberry - Su		5-10					-	
			hackberry - WSp		2-5					rough estimate of percent diet; stomach contents and observations	
			greenbrier - W		2-5						
			holly - W		2-5						
			cherry (cult. and wild) - Su		2-5						
			persimmon - W		2-5						
			grape - FW		2-5						
			corn - Sp		2-5						
Martin et al. 1951	B	B	holly				10-25	32	Florida	NS	Plant foods only - winter. Species comprising less than 2% not included here.
			palmetto				10-25			-	
			blackgum				10-25			rough estimate of percent diet; stomach contents and observations	
			chinaberry				5-10				
			beautyberry				5-10				
			greenbrier				2-5				
Martin et al. 1951	B	B	hackberry - WSp		10-25			130	central US	NS	Plant foods only. All seasons together, but abbreviation following plant name notes what season that plant is important. Samples from: winter = 39; spring = 29; summer = 52; fall = 10. Species comprising less than 2% not included here.
			grape (cult. and wild) - SuF		10-25					-	
			cherry (cult. and wild) - Su		5-10					rough estimate of percent diet; stomach contents and observations	
			Russianolive - Su		2-5						
			sumac - WSp		2-5						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Martin et al. 1951	B	B	cedar - FW hackberry - F Russianolive - W sumac - W currant - Su serviceberry - Su		10-25 5-10 5-10 2-5 2-5 2-5			113	w US (excl. Pacific)	NS - rough estimate of percent diet; stomach contents and observations	Plant foods only. All seasons together, but abbreviation following plant name notes what season that plant is important. Samples from: winter = 5; spring = 50; summer = 53; fall = 5. Location is western US, not including California, western Oregon, or western Washington. Species comprising less than 2% not included here.
Martin et al. 1951	B	B	peppertree (CA) -WSp grape (cult.) - FW prune - FW cherry (cult. and wild) - SuF raspberry - Su apple - W		10-25 10-25 5-10 5-10 2-5 2-5			114	CA, w OR, w WA	NS - rough estimate of percent diet; stomach contents and observations	Plant foods only. All seasons together, but abbreviation following plant name notes what season that plant is important. Samples from: winter = 41; spring = 41; summer = 13; fall = 19. Species comprising less than 2% not included here.
Skorupa & Hothem 1985	B	B	grapes animal other plants		85 12 5			45	California 1982	vineyards - aggregate % wet weight; gizzard contents	Mean of values from two vineyards. Aggregate % wet weight = the mean of the percent (by wet weight) that each food item was in stomach contents of each bird.
Wheelwright 1986	B	B	fruit invertebrates	7 93	68 32	92 8	83 17	1,260	eastern US 1885-1950	NS - % by volume; stomach contents	Based on data from the U.S. Biological Survey and U.S. Fish and Wildlife Service collected from 1885-1950. Percentage of diet that is soft-bodied invertebrates (e.g., earthworms) are underestimated by an unknown amount.
Wheelwright 1986	B	B	fruit invertebrates	8 92	41 59	76 24	73 27	240	central US 1885-1950	NS - % volume; stomach contents	Based on data collected by the U.S. Biological Survey and the U.S. Fish and Wildlife Service from 1885-1950. Percentage of diet that is soft-bodied invertebrates (e.g., earthworms) are underestimated by an unknown amount.

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Wheelwright 1986	B	B	fruit	17	29	63	70	436	western US 1885-1950	NS - % volume; stomach contents	Based on data collected by the U.S. Biological Survey and the U.S. Fish and Wildlife Service from 1855-1950. Percentage of diet that is soft-bodied invertebrates (e.g., earthworms) are underestimated by an unknown amount.
			invertebrates	83	71	37	30				
Wheelwright 1986	B	B	Prunus		23			1,260	eastern US 1885-1950	NS - % frequency of occurrence (fruit only); stomach contents	Ten most common fruit genera found in stomach contents (all seasons) based on data collected by the U.S. Biological Survey and U.S. Fish and Wildlife Service; see above record for eastern U.S. for distribution of % of fruit eaten across seasons. Total of 50 genera found.
			Cornus		7						
			Rhus		7						
			Rubus		6						
			Smilax		6						
			Vaccinium		4						
			Ilex		4						
			Morus		4						
			Celtis		3						
			Juniperus		3						
Wheelwright 1986	B	B	Lepidoptera-unident.		12			1,260	eastern US 1885-1950	NS - % frequency of occurrence (invertebrates only); stomach contents	Ten most common invertebrate taxa found (all seasons) based on data collected by the U.S. Biological Survey and Fish and Wildlife Service; see above record for eastern U.S. for distribution of % of invertebrates eaten across seasons. Soft bodied invertebrates (e.g. earthworms, caterpillars) are likely to be under-represented in this sample. Total of 91 invertebrate families found.
			Carabidae		10						
			Curculionidae		8						
			Scarabaeidae		8						
			Formicidae		7						
			Elateridae		5						
			Coleoptera-unident.		4						
			Arachnida		4						
			Pentatomidae		3						

***** POPULATION DYNAMICS *****

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
TERRITORY SIZE													
Butts 1927	A	B	-	SP	0.21		ha				NS	NS	As cited in Armstrong 1965.
Howell 1942	A	B	1	SU	0.11		ha				sc New York 1937-38	forest	Nesting territory; some used additional areas for feeding. (1) Dense population in coniferous forest; (2) sparse population in unspecified forested area.
	A	B	2	SU	0.21		ha						
Pitts 1984	A	B	-	SP	0.42		ha	0.12	0.84	62	Tennessee 1971-80	suburban (campus)	"Territories" (occasionally left territory to feed).
Young 1951	A	B	-	SP	0.12		ha	0.04	0.24		Wisconsin 1947-49	park-like	Breeding season territory; robins occasionally left to feed.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
FORAGING HOME RANGE													
Howell 1942	A	B	-	SU	0.4		km				sc New York 1937-39	forest	Foraging radius; robins found to travel "at least" this far "in search of food."
Weatherhead & McRae 1990	A	B	1	SU	0.15	0.021 SE	ha			24	e Ontario 1987-88	deciduous forest	Foraging home range of adult: (1) feeding nestlings; (2) feeding fledglings.
	A	B	2	SU	0.81	0.13 SE	ha			24			
POPULATION DENSITY													
Howell 1942	A	B	1	SU	8.6		pair/ha				sc New York 1937-38	forest	(1) dense coniferous forest - 1.7 ha total area; (2) unspecified forest type - 3.7 ha.
	A	B	2	SU	4.9		pair/ha						
Knupp et al. 1977	A	B	-	SU	0.106	0.0078 SE	pair/ha				n Maine 1971	forest	Conservative estimate of breeding density; mean of four study areas.
Pitts 1984	A	B	-	SP	1.98	0.48 SD	pair/ha	1.39	2.54	7 yr	Tennessee 1971-80	suburban (campus)	
Young 1951	A	B	-	SP	5.51	0.75 SD	pair/ha	4.69	6.17	3 yr	Wisconsin 1947-49	park-like area	Size of habitat = 2.1 ha.
CLUTCH SIZE													
Howell 1942	-	-	-	-	3.41	0.61 SD		1	5	127	sc New York 1937-38	forest	
Klimstra & Stieglitz 1957	-	-	-	-	3.17			1	5	29	Illinois 1955	suburban	Clutch size per completed (i.e., incubated) nest.
Klimstra & Stieglitz 1957	-	-	-	-	3.44			2	4	81	Iowa 1946-48	suburban & rural	Clutch size per completed (i.e., incubated) nest.
Knupp et al. 1977	-	-	-	-	3.16					38	n Maine 1971	forest	
Young 1955	-	-	-	-	3.45	0.59 SD		1	5	146	Wisconsin 1947-49	park	
CLUTCHES/YEAR													
Brackbill 1952	-	-	-	-	1.91		/yr	1	3	11	Maryland 1942-51	NS	One pair attempted 3 broods, 2 attempted one and 9 pairs attempted 2. As cited in Henny 1972.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Howell 1942	-	-	-	-	2		/yr	1	3		sc New York 1937-38	forest	
Knupp et al. 1977	-	-	-	-			/yr		2		n Maine 1971	forest	Maximum possible due to the short breeding season in northern Maine.
DAYS INCUBATION													
Howell 1942	-	-	-	-	12-14		days			16	sc New York 1937-39	forest	
Young 1955	-	-	-	-	12.5	0.14 SE	days	10	14	57	Wisconsin 1947-49	park	Also included data from Howell 1942 (Ithaca, NY) in calculations.
AGE AT FLEDGING													
Howell 1942	-	B	-	-	13		days	10	15	33	sc New York 1937-38	forest	
Weatherhead & McRae 1990	-	B	-	-	13.0	0.02 SD	days			43	e Ontario 1987-88	deciduous forest	From hatching of first egg.
Young 1955	-	B	-	-	13.4	0.13 SE	days			89	Wisconsin 1947-49	park	
N FLEDGE/BREEDING PAIR													
Howell 1942	-	-	-	-	3.9		N/breed pr			78	sc New York 1937-38	forest	Estimate of young produced per pair over entire breeding season; pairs attempted to raise up to three broods. N = number of nests.
Weatherhead & McRae 1990	-	-	1	-	1.42	0.35 SE	N/breed pr			19	e Ontario 1987-88	deciduous forest	Year (1) 1987 - a total of 32 nests found, but no second nest fledged young; (2) 1988 - 28 nests found, 3 of 10 second nests fledged young.
	-	-	2	-	1.50	0.45 SE	N/breed pr			18			
Young 1955	-	-	-	-	5.6		N/breed pr				Wisconsin 1957-49	park	Estimate of young produced per pair over entire breeding season.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
N FLEDGE/SUCCESSFUL NEST													
Howell 1942	-	-	-	-	2.4		N/suc nest			42	sc New York 1937	forest	
Knupp et al. 1977	-	-	-	-	2.5	0.15 SD	N/suc nest			38	n Maine 1971	forest	
Weatherhead & McRae 1990	-	-	1	-	2.5		N/suc nest			11	e Ontario 1987-88	deciduous forest	Year (1) 1987; (2) 1988.
	-	-	2	-	3.0		N/suc nest			9			
Young 1955	-	-	-	-	2.9		N/suc nest	2.4	3.4	86	Wisconsin 1947-49	park	Minimum and maximum of five study areas. N = number fledged.
PERCENT NESTS SUCCESSFUL													
Howell 1942	-	-	1	-	35		% nest suc			124	sc New York 1937-38	forest	Percent fledging at least one young from (1) first brood (1937-38); (2) second brood (1937).
	-	-	2	-	75		% nest suc			44			
Klimstra & Stieglitz 1957	-	-	-	-	93.5		% hatc suc			31	Illinois 1955	suburban	Nest success defined as one or more eggs hatched.
Klimstra & Stieglitz 1957	-	-	-	-	47.2		% hatc suc	42	51	81	Iowa 1946-48	suburban & rural	Nest success defined as one or more eggs hatched. Mean of three years.
Weatherhead & McRae 1990	-	-	1	-	78		% hatc suc			32	e Ontario 1987-88	deciduous forest	Year (1) 1987; (2) 1988.
	-	-	2	-	64		% hatc suc			28			
Young 1955	-	-	1	-	58		% hatc suc	46	66		Wisconsin 1947-49	park, cemetery	Three year mean of % of nests (1) hatching at least one egg; (2) fledging at least one young.
	-	-	2	-	49		% nest suc	32	62				
AGE AT SEXUAL MATURITY													
Henny 1972	-	B	-	-	1		year				NS	NS	Assumption used in population modeling study.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
ANNUAL MORTALITY													
Farner 1949	-	B	-	-	53		%/yr				US, Canada 1920-1940	NS	Calculated from band returns of birds banded as fledglings in 1920-40 in ne, nw, and central U.S. and sw Canada. Annual mortality from Jan. 1 to next Jan. 1; (period from fledging to first Jan. 1 not included).
Henny 1972	A	B	-	-	50.8	0.5 SE	%/yr				N America 1946-65	NS	Adult value estimated by composite dynamic method based on birds banded from 1946-65. Juvenile value is from fledge to next breeding season based on assumption of stable populations with (1) the adult value; (2) 1 year olds try to breed; and (3) annual recruitment rate of 4.58 - 5.76 per pair.
	J	B	-	-	78-82		%/yr						
LONGEVITY													
Farner 1949	A	-	-	-	1.3-1.4		years				US, Canada 1920-40	NS	Calculated (from Jan 1. of first year) as 1/m - (1-p) where m = mean annual mortality rate and p = the mean period lived during the year in which death occurs.
Farner 1945	-	-	-	-			years		9		US, Canada 1920-40	NS	Oldest robin recovered in banding study; estimates potential natural longevity to be at least 9 or 10 years.

***** SEASONAL ACTIVITIES *****

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING						
Howell 1942	late Apr		earl May	sc New York 1937-39	forest	First brood.
Howell 1942	late May		earl Jun	sc New York 1937-39	forest	Second brood.
Howell 1942	earl Jun		mid Jul	sc New York 1937-39	forest	Third brood.

Reference	Begin	Peak	End	Location	Habitat	Notes
Klimstra & Stieglitz 1957	Apr 1	mid Apr	Apr 23	Illinois 1955	suburban	
Klimstra & Stieglitz 1957	earl Apr	mid+ Apr		Iowa 1946-48	suburban & rural	
Knupp et al. 1977	May 10	May 21-25	July 6	n Maine 1971	forest	
Pitts 1984		earl April		Tennessee, 1971-76	suburban (campus)	
Young 1955	mid Apr		late Jul	Wisconsin 1947-49	park-like area	Laying of up to three clutches.
HATCHING						
James & Shugart 1974	earl May			California, New Mex.	NS	
James & Shugart 1974	late Apr			Ohio, Missouri	NS	
James & Shugart 1974	earl May			VA, WV, NY, Wash. DC	NS	
James & Shugart 1974	mid May			VT, NH, CT	NS	
James & Shugart 1974	mid May			Montana	NS	
James & Shugart 1974	earl Jun			Colorado	NS	
James & Shugart 1974	mid Apr			Kentucky	NS	
Klimstra & Stieglitz 1957	Apr 20	late Apr		Illinois 1955	suburban	
Klimstra & Stieglitz 1957	Apr	earl May		Iowa 1946-48	suburban & rural	
FLEDGING						
James & Shugart 1974			earl Jul	California, New Mex.	NS	

Reference	Begin	Peak	End	Location	Habitat	Notes
James & Shugart 1974			earl Aug	Kentucky	NS	
James & Shugart 1974			earl Jul	VA, WV, Wash. DC	NS	
James & Shugart 1974			late Jul	MO, OH, MT, CO	NS	
James & Shugart 1974			mid Jul	VT, NH, CT, NY	NS	
Knupp et al. 1977			earl Aug	n Maine 1971	forest	
Young 1951	mid May	earl Jun	mid Aug	Wisconsin 1947-49	park, cemetery	Fledging of up to three broods per season.
FALL/BASIC MOLT						
Bovitz 1990	Aug		Sept	New Jersey	NS	As cited in Morrison and Caccamise 1990.
Wheelwright 1986		Jul & Aug		North America	NS	Robins undergo a complete molt.
FALL MIGRATION						
Fuller 1977	mid Sept	mid Oct	earl Nov	Minnesota 1971-76	NS	Robins migrating through Minnesota.
Howell 1942			earl Nov	sc New York 1937-39	forest	Last dates robins found in area.
SPRING MIGRATION						
Howell 1942	Feb		Mar	sc New York 1937-39	forest	Arrival of breeding robins.
Knupp et al. 1977		earl Apr		n Maine 1971	forest	Arrival of breeding robins.
Young 1951	Mar 11		mid Apr	Wisconsin 1947-49	park-like area	Arrival of males.
Young 1951	Mar 26		mid Apr	Wisconsin 1947-49	park-like area	Arrival of females.